Not to be cited without
permission of the authors[1]

Ne pas citer sans
autorisation des auteurs[1]

DFO Atlantic Fisheries
Research Document 96/89

MPO Pêches de l'Atlantique
Document de Recherche 96/89

Status of the Exploits River stock of Atlantic salmon (Salmo salar L.) in 1995

by

C. E. Bourgeois, J. Murray, and V. Mercer
Science Branch
Department of Fisheries and Oceans
P. O. Box 5667
St. John's, Newfoundland A1C 5X1

[1]This series documents the scientific basis for the evaluation of fisheries resources in Atlantic Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

Research documents are produced in the official language in which they are provided to the secretariat.

[1]La présente série documente les bases scientifiques des évaluations des ressources halieutiques sur la côte atlantique du Canada. Elle traite des problèmes courants selon les échéanciers dictés. Les documents qu'elle contient ne doivent pas être considérés comme des énoncés définitifs sur les sujets traités, mais plutôt comme des rapports d'étape sur les études en cours.

Les Documents de recherche sont publiés dans la langue officielle utilisée dans le manuscrit envoyé au secrétariat.

Abstract

The Exploits River was the site of an Atlantic salmon colonization program from 1957-1993.Counts of at fishways and angling data provided the basis for assessing the status of the salmon population and determining percent of target egg deposition achieved. The 1995 returns to the Exploits was 93% of the average 1992-94 returns and 213% of the 1987-1991 mean and 136% of the 1984-1989 mean. In 1995 the lower, middle and upper Exploits received 99%, 24% and 12% of the required egg deposition respectively.

Résumé

La rivière Exploits a été le site d'un programme de colonisation du saumon atlantique de 1957 à 1993. Les dénombrements effectués à des passes migratoires et des données sur la pêche sportive ont été utilisées pour évaluer la situation de la population de saumon et déterminer le pourcentage de la ponte cible réalisé. La remonte de 1995 s'est située à 93 % de la moyenne 1992-1994, à 213 % de la moyenne 1987-1991 et à 136 % de la moyenne 1984-1989. En 1995, l'étendue d'amont, médiane et d'aval de la rivière a connu respectivement 12 %, 24 % et 99 % de la ponte cible.

Introduction

The Exploits River is the largest watershed in insular Newfoundland, encompassing a drainage area of 11,272 km² (Porter et al. 1974). The river flows in a northeasterly direction, entering the sea in SFA 4 (Fig. 1). Prior to the inception of enhancement activity (O'Connell and Bourgeois, 1987) less than 10% of watershed area was available to anadromous Atlantic salmon due to the presence of natural and man-made obstructions (Taylor and Bauld, 1973). The Exploits River requires 95.9 million eggs to meet its required target egg deposition (Table 1); however, to date, only 53% of the colonizable habitat within the watershed has been stocked.

The intent of this document is to review the status of the stock in 1995.

Background

For details of the stocking conducted in the various sections of the Exploits River(Fig.2), refer to Tables 2-4. With respect to the middle Exploits, 26,612 riverine units (egg requirement 45,040,320) of habitat did not receive the required five years of stocking to establish a self-sustaing run.

Management measures implemented in 1992, which remained in place are as follows:

1.Moratorium on commercial salmon fishing in insular Newfoundland.

2.Moratorium on the northern cod fishery affecting Salmon Fishing Areas (SFA's) 1-9 implemented on July 15, 1992. This measure eliminated by-catch of salmon in cod fishing gear.

In 1994, due to the low egg deposition in the upper Exploits (1991-1994 Table 4) and that the expected low returns in 1995 would represent returns from the last year of fry stocking, concern was expressed with respect to future returns to Red Indian lake fishway. The increase in angling effort and catch(Table 5) realized on the Exploits in 1994 further reduced the rate of increase of spawners in the upper Exploits. In an effort to increase escapement at Red Indian Lake in 1995 to about 1,000 fish the following management measures for the recreational fishery were put in place. In addition to the above management measures DFO with funding from University of Waterloo

transferred approximately 300 adults from Grand Falls to a location within Red Indian lake.

Lower Exploits:

From June 24 - July 7 the recreational fishery was restricted to hook and release only.

From July 8 - July 31 A quota of 700 fish for retention with hook and release fishery.

From Aug. 1 - Aug.27 A quota of 300 fish for retention with Hook and release fishery.

Middle and Upper Exploits

Hook and Release fishery for season.

The quota of 700 salmon was reached on July 12 and on July 13 the river was opened to hook and release only.

However as a result of angler complaints and demonstrations the lower Exploits was opened to catch and retain fishing on July 15 with a quota of 300 salmon. This quota was taken on July 18 and the river was open to hook and release fishing only.

The 300 salmon quota for August was reached on Aug.9 and was followed by hook and release fishing until Aug. 27.

In the middle Exploits Badger Brook was open to retention with a quota of 30 fish from Aug. 11 - Aug.27.

Methods

Fish are enumerated at four fishway locations on the Exploits; I) Bishop Falls fishway which enumerates all fish entering the river at the community of Bishop Falls on the main stem of the river in the lower Exploits ii) Camp 1 fishway on Great Rattling Brook in the lower Exploits iii) Grand Falls fishway on the main stem of the Exploits at the community of Grand Falls-Winsor which enumerates all fish entering the middle and upper Exploits and iv) Red Indian Lake fishway at the outflow of Red Indian Lake which enumerates all fish entering the upper Exploits.

Fry stocking was conducted utilizing mainly helicopters with minimal distribution via vehicle (in accessible locations) in riverine habitat. Stocking was conducted such that the habitat that was stocked received 75 fry per unit of habitat. Fry were stocked along the river banks in areas of low flow with depth less than 30 cm in areas where gravel/cobble substrate was present. If suitable habitat was available fry were stocked at one quarter kilometre intervals on opposite sides of the river. The number of fry released in individual drops ranged from 5,000 - 50,000 depending on the available habitat to be stocked. Releases in excess of 25,000 were only conducted on the main stem of the river in the middle Exploits.

Angling catch and effort data prior to 1994 were supplied by DFO staff and from 1994 to present the data were collected by DFO staff and River Monitors. Angling statistics presently (1994-1995) collected are reported for 7 various locations of which five are located in the lower Exploits; **lower** I) downstream of the Bishops Falls fishway ii) Bishop Falls fishway to Grand Falls fishway (main stem of river only) iii) Great Rattling Brook downstream of Camp 1 fishway (includes angling at the mouth of Great Rattling Brook and therefore all fish angled at this location are not destined for Great Rattling Brook) iv) Great Rattling Brook upstream of Camp 1 fishway v)Stoney Brook (includes angling at the mouth of Stoney Brook and therefore all fish angled at this location are not destined for Stoney Brook) **middle** vi) Grand Falls fishway to Red Indian Lake fishway **upper** vii) upstream of Red Indian Lake. From 1985-1993 angling data was collected from four locations and prior to 1985 data was collected from three locations (Table 5).

Angling exploitation rates for above and below Bishop Falls are calculated as follows; Below Bishop Falls fishway = angling below Bishop Falls fishway / (count at Bishop Falls fishway + angling below Bishop Falls fishway); Above Bishop Falls fishway = angling above Bishop Falls fishway / count at Bishop Falls fishway

Habitat determinations and target egg depositions are detailed in Table 1. Target egg requirement was calculated based on 240 egg/m^2 and 7 smolts/ha of standing water. Smolt production of 7 smolt/ha was divided by 1.9% to convert this to eggs (O'Connell et al., 1991).

Biological characteristic data presented in Tables 6 and 7 was collected from various locations within the Exploits watershed as detailed in the various tables.

Spawning escapement was calculated by subtracting angling catches and known removals from counts at fishways without inclusion of an estimate for poaching and disease or hook and release mortality.

Egg deposition is calculated based on a length fecundity relationship based on mean length of female fish. Data collected from broodstock from 1984-1991 were used to determine mean female length and percent female fish in the run. Calculations use a mean female length of 52 cm (a mean no. of eggs per female of 2198.) and that females compromise 77% of the run. **Caution**: Mean length of female fish may have changed since the 1992 management changes to commercial exploitation.

In order to calculate the egg deposition in areas where fry stocking occurred, an estimate of egg-to-fry survival of 20% (Sturge, 1968) was used to back calculate fry to eggs. Sturge (1968) gave a range of 10-30% for egg-to-fry survival and indicated that a figure of 20% appeared to be a reasonable value.

Results and Discussion

Table 1 details the accessible rearing area and target egg deposition for the Exploits River. The use of fixed parameters, such as 240 eggs/m^2 of fluvial habitat and 7 smolts/ha of standing water habitat, has certain limitations (see O'Connell & Dempson, 1991 for discussion on this topic).

The 1995 count at the Bishop's Falls fishway of 16,655 (15,723 small and 941 large) adults was 97% of 1994 count(Table 8). The 1995 escapement to the Exploits (17090) was 93% of the 1992-94 escapement and 213% of the 1987-1991 mean and 136% of the 1984-1989 mean.

Table 5 details the angling statistics for the Exploits watershed. The 1995 catch of 1,336 was below the 1990-1994 mean of 1,619 fish and 43.5% of the 1994 catch. Of particular interest is the retained catch of 1,300 fish in 15 days. Angling exploitation(retention only)downstream of Bishop Falls has generally declined since the early 1980's with the 1980-1995 mean being 51.4%(range 87.6%-24.1%) of total catch and the 1985-1995 and 1990-1995 means being 41.6% and 46.0% respectively of total retained fish. It is very likely that the late opening for the retention fishery on the Exploits in 1995 had an impact on the retention fishery downstream of Bishop Falls which accounted for 32.5% of the 1995 retention catch.

Run timing(cumulative percent of run to date) for Bishops, Camp 1 and Grand Falls fishways are presented in Tables 9-11 respectively. The dates for 50 percent of the escapement for Bishops, Camp 1 and Grand Falls fishways are the week of July 19, July 28 and August 6 respectively. Mid season reviews of escapement for various watershed sections could be conducted at the latter referenced dates respectively as the count would represent 50% of the run.

Egg Deposition and Percent of Target Egg Achieved

Lower Exploits

Table 2 details the number of spawners and subsequent egg deposition and % target egg deposition achieved for Great Rattling Brook and for other tributaries (combined) of the lower Exploits for the period 1957-1995. The egg deposition for Great Rattling Brook in 1995 was only 50% of target which was higher than observed in 1994 but lower than the 1984-89 average(64.6%) and 1992-94 average (66.6%).Since the moratorium Great Rattling Brook has received between 43 and 96% of target egg deposition while the various other tributaries of the Lower Exploits have received between 115 and 280% of target egg deposition.

The results of spawning surveys conducted on various tributaries of the Lower Exploits from 1992-94 are detailed in Table 12. The Lower exploits requires 9,666 spawners to meet it's egg target with 6,169 of these spawners required in Great Rattling Brook. Greenwoods, Stoney, Little Rattling and Three Brooks require 3,497 spawners for their egg target. From 1975 to present these latter four tributaries have received an average of 3,596 (range 660 -9,436) per year. Spawning surveys conducted in 1992 and 1993 could not account for 2,309 and 5,199 spawners respectively. In 1995 the difference between the number of salmon counted at Bishop Falls fishway and the sum of the counts at Grand Falls and Camp 1 fishways plus angling is 6,104 salmon. This would imply that 6,104 salmon spawned in Little Rattling, Greenwoods and Three Brooks equivalent to 192% of their egg target. Table 2 details the overall egg deposition for the lower exploits broken down into Great Rattling Brook and other tributaries. The dissimilarity in production of the four tributaries in question is disturbing due to the close proximity and similarity of habitat of these tributaries. This is borne out in that the four tributaries in question account for 34% of the habitat in the Lower Exploits and 6% of the habitat in the watershed but yet is receiving on average 32% of the adults migrating through Bishop Falls fishway.

Middle Exploits

The middle Exploits requires a deposition of 64.2 million eggs to meet its total seeding requirement (Table 1); however the 187,668 units(egg requirement $45x10^8$) in the main stem of the river have not received adequate stocking to be producing a self-sustaining run of adults. Furthermore it is questioned if smolt production in the order of 3 smolts per unit should be expected from this habitat.

The middle Exploits received an egg deposition of 15.46 million eggs from natural spawning which is 24.1% of the target 80.5% of the 19.2 million target if one excludes the main stem of the river(Table 3).

The returns to Grand Falls in 1995 were the offspring of the natural spawners in 1990(2 in total) and fry stocking in 1990 and 1991. The escapement to Grand Falls in 1995 is the second highest recorded to date.

Upper Exploits

The upper Exploits requires an egg deposition of 15.4 million eggs but only received 12.1% of this target in 1995(Table 4). This was in part accomplished by the transfer of 314 adults from Grand Falls fishway. With the cessation of stocking in 1991 and few spawners in 1990 and 1991 returns during the next three years are expected to be very low. The 1996 returns are mainly the offspring fry stocked in 1991. The authors strongly recommend that measures be undertaken to increase the egg deposition in the upper Exploits.

1996 Management Plan

The following Management Plan has been announced for the 1996 angling fishery:

Exploits River below Grand Falls

- Catch-and-release angling only June 22-July9 and August 16-Sept. 2
- Catch-and-retain angling July 10- Aug.15. No quota. An in season review in late July will determine if a spawning escapement of 13,000 will be achieved. And if not angling will revert to catch-and-release only.

Exploits River above Grand Falls

- The main stem of the river from Grand Falls to Red Indian Lake, and all tributaries above Red Indian Lake dam , will be open only for catch-and-release angling for the entire season.
- Tributaries between Grand Falls and Red Indian Lake will be open for catch-and-retain angling July 10- Aug. 15 inclusive. Catch-and-release angling will apply before and after these dates.
- 1,000 fish will be trucked from Grand Falls to Red Indian Lake.

Management Considerations

One of DFO'S objectives on the Exploits River is to increase spawning escapement above Red Indian Lake. This was attempted in 1995 through quotas and catch-and-release angling. It is suggested that in 1996 that the recreational fishery be controlled through catch-and-release angling with no quota on catch-and-retain fishing. The spawning escapement on the Exploits River should not be allowed to decrease to below 13,000 adults. To further address the escapement above Red Indian Lake it is recommended that at least 1,000 adults be trucked from Grand Falls fishway to Red Indian Lake.

References

O'Connell, M. F., and C. E. Bourgeois. 1987. Atlantic Salmon Enhancement in the Exploits River, Newfoundland, 1957-1984. N. Am. J. Fish. Manage. 7:207-214.

O'Connell, M. F., and J. B. Dempson. 1991. Atlantic salmon (*Salmo salar* L.) target spawning requirements for rivers in Notre Dame Bay (SFA 4), St. Mary's Bay (SFA 9), and Placentia Bay (SFA 10), Newfoundland. CAFSAC Res. Doc. 91/18. 14p.

O'Connell, M. F., J. B. Dempson, and R. J. Gibson. 1991. Atlantic salmon (*Salmo salar* L.) smolt production parameter values for fluvial and lacustrine habitats in insular Newfoundland. CAFSAC Res. Doc. 91/19. 11p.

Porter, T. R., L. G. Riche, and G. R. Traverse. 1974. Catalogue of rivers in insular Newfoundland. Vol. D. Resource Development Branch, Newfoundland Region. Data Record Series No. NEW/D-74-9: 353p.

Sturge, C. C. 1968. Production studies of the young stages of Atlantic salmon (*Salmo salar* L.) in an experimental area of Indian River, Notre Dame Bay, Newfoundland. M.Sc. Thesis, Dept. Biology, Memorial Univ. of Newfoundland. 134p.

Taylor, V. R., and B. R. Bauld. 1973. A program for increased Atlantic salmon (*Salmo salar*) production on a major Newfoundland River. Int. Atl. Salmon Found. Spec. Publ. Ser. 4: 339-347.

Table 1: Rearing area and target egg deposition for sections of the Exploits River.

Exploits River	Riverine Habitat (m^2)	Lacustrine Habitat (ha)	Target Egg Deposition
Lower	**57,552**	**6,915**	**16,360,112**
Middle	**234,873**	**21,178**	**64,171,941**
main stem	187,668	0	45,040,320
tributaries	47,205	21,178	19,131,621
Upper	**55,437**	**5,665**	**15,384,617**
Total	**347,862**	**33,758**	**95,916,670**

Table 2. Details of egg deposition Lower Exploits(G.R.B.=Great Rattling Brook; Other=Other Tributaries)

Year	No. fry released G.R.B.	No. spawners G.R.B.	No. spawners other	Total eggs G.R.B.	Total eggs other	% Target G.R.B.	% Target other	% Target total
1957		610	*	1,032,401	*	10	*	*
1958		786	*	1,330,274	*	13	*	*
1959		329	1,005	556,819	*	5	*	*
1960		785	892	1,328,581	1,509,674	13	28	18
1961		626	577	1,059,480	976,549	10	18	13
1962		1,212	*	2,051,262	*	20	*	*
1963		578	691	978,242	1,169,490	9	22	14
1964		1,886	*	3,191,980	*	31	*	*
1965		777	594	1,315,041	1,005,321	13	19	1
1966		1,412		2,389,754	0	23	0	15
1967		1,204	829	2,037,722	1,403,049	20	26	22
1968		2,021	*	3,420,462	*	33	*	*
1969		1,182	272	2,000,488	460,349	19	9	16
1970		1,222	*	2,068,186	*	20	*	*
1971		1,163	66	1,968,331	111,702	19	2	13
1972		729	114	1,233,803	192,940	12	4	9
1973		*	*	0	*	*	*	*
1974		*	2,647	0	4,479,942	*	83	*
1975		4,601	4,225	7,787,008	7,150,644	75	133	94
1976		2,004	983	3,391,690	1,663,688	32	31	32
1977		3,632	1,395	6,147,015	2,360,982	59	44	54
1978		2,139	671	3,620,172	1,135,641	35	21	30
1979		3,048	2,434	5,158,618	4,119,448	49	77	59
1980		4,611	*	7,803,933	*	75	*	*
1981		4,741	660	8,023,953	1,117,024	77	21	58
1982		2,877	2,258	4,869,207	3,821,575	47	71	55
1983		3,252	*	5,503,880	*	53	*	*
1984		6,178	5,679	10,456,018	9,611,480	100	179	127
1985		5,952	3,712	10,073,522	6,282,412	96	117	103
1986		2,742	3,035	5,616,360	5,136,616	54	95	68
1987	195,127	230	3,236	4,744,161	5,476,801	45	102	65
1988	870,979	896	1,900	6,469,514	3,215,674	62	60	61
1989	990,614	46	2,574	3,215,478	4,356,392	31	81	48
1990	627,525	11	2,313	3,483,172	3,914,660	33	73	47
1991	692,911	1,086	1,993	1,838,012	3,755,473	18	70	35
1992	76,480	3,762	3666+	6,367,035	6,204,558	61	115	79
1993	0	5,927	4273+	10,031,210	7,231,882	96	134	109
1994	0	2637	8,909	4,463,017	15,078,126	43	281	124
1995	0	3113	6104	5,268,628	10,330,776	50	192	99

* indicates no data
+ results of spawning survey

Table 3. Details of egg deposition Middle Exploits.

Year	No. Fry Released	Spawners Released	Natural Egg Deposition	Fry to Egg Equiv.	Total Eggs	%Target Egg Achieved
1967	0	0	0	768600	768600	1.2
1968	153720	0	0	841700	841700	1.3
1969	168340	0	0	1644600	1644600	2.6
1970	328920	0	0	1479730	1479730	2.3
1971	295946	0	0	1612530	1612530	2.5
1972	322506	0	0	2053445	2053445	3.2
1973	410689	0	0	1779000	1779000	2.8
1974	355800	31	88491	1063050	1151541	1.8
1975	212610	650	1855455	6463125	8318580	13.0
1976	1292625	79	225509	6733930	6959439	10.8
1977	1346786	27	77073	6832050	6909123	10.8
1978	1366410	0	0	3628785	3629785	5.7
1979	725757	47	134164	9352470	9486634	14.8
1980	1870494	2246	6411309	4513470	10924779	17.0
1981	302694	2586	7381855	3941270	11323125	17.6
1982	788254	1229	3508236	1926610	5434846	8.5
1983	385322	810	2312182	3960965	6273147	9.8
1984	792193	3750	10704545	2539510	13244055	20.6
1985	507902	2981	8509400	2558670	11068070	17.2
1986	511734	0	0	5333120	5333120	8.3
1987	1066624	80	228364	5243995	5472359	8.5
1988	1048799	5	14273	7854460	7868733	12.3
1989	1570892	0	0	8758425	8758425	13.6
1990	1751685	2	5709	7436240	7441949	11.6

1991	1487248	267	782164	9304990	10067154	15.7
1992	1605761	1441	4113400	8464850	12578250	19.6
1993	1692970	5174	14769418	0	14769418	23.0
1994	0	5967	17033073	0	17033073	26.5
1995	0	5416	15460218	0	15460218	24.1

Note: Egg target is 64 million (45 for main stem and 19 for tributaries)

Table 4. Details of egg deposition Upper Exploits.

Year	No. Fry Released	Fry to egg	Adults Spawning	Total Eggs	% Target egg Deposition
1975	0	952665	0	952665	6.19
1976	190533	892390	0	892390	5.80
1977	178479	155580	0	155580	1.01
1978	31116		0	0	0.00
1979	0	0	0	0	0.00
1980	0	3326500	0	3326500	21.62
1981	665300	4460735	0	4460735	28.99
1982	892147	2041055	0	2041055	13.27
1983	408211	1992570	0	1992570	12.95
1984	398514	4403050	0	4403050	28.62
1985	880610	8189350	0	8189350	53.23
1986	1637870	11078265	0	11078265	72.01
1987	2215653	14895245	0	14895245	96.82
1988	2979049	19275305	0	19275305	125.29
1989	3855061	18345255	0	18345255	119.24
1990	3669051	13471645	0	13471645	87.57
1991	2694329	0	28	47389	0.31
1992	0	0	141	238637	1.6
1993	0	0	585	990089	6.4
1994	0	0	633	1071327	7.0
1995	0	0	1102	1865091	12.1

Table 5. Angling statistics for Exploits River

Year	Below Bishop Falls	Great Rattling Brook	Stoney	Bishop Falls to Grand Falls	Grand Falls to Red Indian Lake	Above Red Indian Lake	Total
1975	1563	47	9				1619
1976	1651	222	61				1934
1977	1342	417	93				1852
1978	990	241	249				1480
1979	1431						1431
1980	1417	164	204				1785
1981	1558	303					1861
1982	1519	132	82				1733
1983	527	332	494				1353
1984	1809	398	217				2424
1985	903	560	1004	531			2998
1986	646	478	631	302			2,057
1987	467	94	995	379			1,935
1988	522	50	608	551			1,731
1989	385	16	152	24			577
1990	366	59	454	38			917
1991	414	71	279	281			1,045
1992	966	163	227	52			1,408
1993	831	258	393	173			1,655
1994	1388	492	144	939	110	0	3,073
1995	435	246	419	234	2	0	1336

Table 6. Biological characteristics of Exploits River smolt 1984 -1995.

YEAR	Life Stage	FORK LENGTH			WEIGHT			RIVER AGE		
		MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE
1984	smolt	16.4(954)	2.3	12.0-26.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1985	smolt	16.6(280)	1.9	10.6-26.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1986	smolt	15.4(1378)	2.3	6.70-26.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1987	smolt	17.3(779)	2.3	10.8-28.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1988	smolt	16.3(823)	3.1	10.3-26.7	46.4(823)	29.7	12.8-333.8	3.7(805)	0.8	2.0-7.0
1989	smolt	15.7(600)	2.8	10.1-26.3	43.6(593)	23.2	13.7-176.8	3.4(613)	[illegible]	[illegible]
1990	smolt	16.2(557)	3.0	8.8-33.9	46.7(555)	27.8	8.1-246.0	3.4(552)	[illegible]	[illegible]
1991	smolt	17.5(100)	2.8	12.3-28.4	52.2(100)	27.3	21.6-190.7	3.3(98)	[illegible]	[illegible]
1992	smolt	16.5(173)	1.5	12.9-21.6	42.3(170)	11.7	18.2-104.6	3.4(173)	[illegible]	[illegible]
1993	smolt	16.6(201)	1.9	12.8-23.0	46.4(201)	16.0	[illegible]	3.3(197)	[illegible]	[illegible]
1994	smolt	15.9(215)	1.8	9.2-21.0	39.3(215)	12.4	10.7-79.0	3.5(214)	[illegible]	[illegible]
1995	smolt	15.7(189)	1.9	11.2-23.7	34.6(199)	14.5	13.2-124.4	3.2(199)	0.7	1.0-5.0

Sample Locations
1984 - Bishops Falls forebay, Lake Ambrose, Lloyd's River
1985 - Bishops Falls forebay
1986 - Bishops Falls forebay, Badger Brook, Great Rattling Brook, Stoney Brook, Little Red Indian Brook, Red Indian Lake, Noel Paul's Brook
1987 - 1990 Bishops Falls forebay, Badger Brook, Great Rattling Brook, Stoney Brook, Little Red Indian Brook, Red Indian Lake, Noel Paul's Brook, Three Brooks, Little Rattling Brook, Greenwoods Brook
1991 - 1993 & 1995 Bishops Falls forebay
1994 - Bishops Falls forebay, Stoney Brook

Table 7. Biological characteristics Exploits River adults 1984 - 1994.

YEAR	LIFE STAGE	FORK LENGTH			WEIGHT			RIVER AGE		
		MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE	MEAN (NO.)	S.D	RANGE
1984	1SW	49.63 (1722)	2.76	39.00-60.00	1.10 (1723)	0.21	.50-2.40	3.22 (1487)	0.45	2-5
	2SW	65.00 (1)			2.20 (1)					
	Repeat	56.17 (65)	4.99	46.50-76.00	1.83 (65)	0.67	.87-4.80	3.32 (53)	0.55	2-5
1985	1SW	50.96 (3604)	2.75	37.00-67.00	1.34 (3604)	0.21	.55-2.96	3.46 (3111)	0.56	2-7
	2SW	53.50 (1)			1.40 (1)					
	Repeat	54.11 (102)	3.38	46.00-63.00	1.56 (101)	0.30	.98-2.64	3.25 (80)	0.52	2-4
1986	1SW	51.23 (243)	5.17	41.10-66.50	1.42 (238)	0.44	.65-2.90	3.56 (242)	0.60	2-5
	2SW	68.10 (21)	2.48	64.50-73.80	3.13 (21)	0.42	2.60-3.99	3.14 (21)	0.57	2-5
	Repeat	66.74 (69)	6.43	44.30-81.00	2.99 (68)	0.74	1.00-4.30	3.19 (67)	0.47	2-4
1987	1SW	50.13 (456)	6.42	27.70-74.00	1.22 (413)	0.54	.40-3.85	3.47 (394)	0.61	2-6
	2SW	68.90 (3)	4.55	64.00-73.00	2.80 (1)			2.50 (2)	0.71	2-3
	Repeat	63.40 (124)	6.81	38.30-77.00	2.50 (96)	0.84	.50-4.60	3.31 (97)	0.57	2-5
1988	1SW	48.58 (475)	5.66	34.69-67.10	1.12 (426)	0.38	.45-2.60	3.50 (448)	0.65	2-6
	2SW	66.20 (4)	6.13	60.50-72.80	2.87 (4)	0.90	2.10-3.99	3.25 (4)	0.50	3-4
	Repeat	58.09 (35)	7.24	39.00-74.00	2.02 (31)	0.86	.65-4.50	3.61 (28)	0.79	2-6
1989	1SW	51.97 (387)	5.68	37.60-68.80	1.37 (376)	0.42	.55-3.00	3.53 (323)	0.63	2-7
	2SW	67.17 (3)	3.41	65.00-71.20	2.73 (3)	0.53	2.25-3.30	3.00 (3)	0.00	3-3
	Repeat	56.73 (37)	8.08	41.00-75.00	1.87 (36)	0.75	.70-4.20	3.33 (30)	0.55	3-5
1990	1SW	53.02 (339)	5.56	40.50-67.00	1.38 (337)	0.41	.58-2.66	3.46 (319)	0.61	2-6
	2SW	66.50 (3)	2.60	63.50-68.00	2.85 (3)	0.45	2.34-3.12	3.67 (3)	0.58	3-4
	Repeat	61.95 (52)	6.75	44.10-80.20	2.300 (52)	0.87	.62-5.20	3.36 (44)	0.49	3-4
1991	1SW	52.58 (218)	5.50	35.00-64.10	1.43 (218)	0.40	.50-2.40	3.60 (203)	0.66	2-6
	2SW	66.70 (1)			2.65 (1)					
	Repeat	56.57 (20)	3.20	47.40-61.50	1.82 (20)	0.27	1.10-2.30	3.72 (18)	0.75	3-5
1992	1SW	54.08 (243)	4.86	38.70-65.70	1.58 (243)	0.38	.65-2.90	3.55 (229)	0.73	2-6
	2SW	68.57 (3)	3.86	64.20-71.50	2.50 (3)	1.95	.25-3.80	3.33 (3)	0.58	3-4
	Repeat	59.59 (40)	4.63	54.00-74.80	2.00 (40)	0.53	.43-4.10	3.56 (36)	0.56	3-5
1993	1SW							3.4[illegible] (94)	0.54	3-5
	Repeat							3.40 (10)	0.70	2-4

1994	1SW	54.43 (774)	2.99	46.00-63.00	1.68 (414)	0.35	.307-2.90	3.38 (786)	0.62	2-5
	Repeat	58.75 (40)	3.23	51.00-63.00	2.19 (24)	0.61	1.36-2.99	3.20 (40)	0.61	2-5

-samples from 1984-1992 were Noel Paul's broodstock
-samples were collected from Grand Falls each year and from Great Rattling Brook from 1986-1990
-1993 and 1994 angling samples from Lower Exploits (main stem of river) and Great Rattling Brook

Table 8 . Counts at various counting facilities on the Exploits River.

Year	Count at Bishops			Count at Camp 1			Count at Grand Falls			Count at Red Indian Lake		
	small	large	total	small	large	total	small	large	total	small	large	total
1959	886	119	*1005									
1960	1013	157	1170	94	9	103						
1961	839	118	957	319	53	372						
1962				1037	31	1068						
1963	1202	65	1267	491	37	528						
1964				1752	116	1868						
1965	1228	203	1431	587	190	777						
1966	829	506	*1335	942	470	1412						
1967	1372	710	2082	822	382	1204						
1968				1334	687	2021						
1969	979	498	1477	892	290	1182						
1970				1023	199	1222						
1971	961	300	1261	902	261	1163						
1972	794	113	907	495	234	*729						
1973	205	89	294									
1974	2538	411	2949				64	0	*64			
1975	9218	1439	10657	5531	505	6036	319	21	340			
1976	3991	460	4451	2935	117	3052	128	5	133			
1977	6148	581	6729	4300	271	4571	244	9	253			
1978	3790	303	4093	2704	81	2785	132	6	138			
1979	6715	277	6992	3925	124	4049	501	8	509			
1980				4597	426	5023	3062	23	3085			
1981	8114	1695	*9809	4264	514	4778	3809	227	4036			
1982	7605	181	7786	2796	122	2918	2321	67	2388			
1983				2952	302	*3254	2182	37	2219			

1984	17219	529	17748	6300	111	*6411	4993	50	5043			
1985	16652	183	16835	5985	38	6023	4992	11	5003			
1986	9697	355	10052	3072	174	3246	2243	67	2310			
1987	9014	310	9324	2327	41	2368	2211	41	2252			
1988	8974	147	9121	3433	10	3443	2535	34	2569			
1989	7192	89	7281	1694	14	1708	2737	70	2807			
1990	6629	122	6751	1057	15	1072	2697	118	2815			
1991	5245	99	5344	1060	40	1100			1614	29	0	29
1992	12538	314	12852	3520	242	3762	2609	64	2673	138	3	141
1993	21319	627	21946	5015	312	*5927	5658	101	5759	571	14	585
1994	16168	916	17084	2488	333	*2821	6430	196	6626	611	25	636
1995	15714	941	16655	2719	394	*3113	N/A	N/A	6523	774	44	818

Table 9. Cumulative percent of run to date for Bishops Falls fishway 1986-1995.

Date	Julian Day	Year									
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
June 9	160	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
	166	0.00	0.12	0.00	0.07	0.00	0.02	0.02	0.00	0.06	0.00
	173	0.41	0.97	0.24	0.76	0.15	0.07	0.10	0.59	0.28	0.38
	179	1.28	3.73	2.02	2.21	1.41	0.32	0.25	1.33	1.67	2.20
Jul. 5	186	4.67	13.89	5.11	14.68	13.23	1.03	1.50	12.67	13.35	11.59
	193	20.28	37.72	25.29	41.00	34.81	5.91	17.94	28.3.	36.37	42.39
	200	37.07	**69.66**	**51.15**	**61.20**	**57.80**	25.77	43.79	45.55	**60.78**	**63.11**
	207	**60.58**	86.75	77.69	77.96	75.13	49.14	**71.87**	**69.60**	74.64	80.13
Aug. 4	214	75.06	93.84	89.90	87.50	85.47	**69.07**	87.75	83.25	87.44	88.61
	221	88.40	96.79	96.08	92.83	90.68	78.37	94.53	93.43	93.26	93.28
	228	92.89	98.22	98.20	96.64	94.67	88.17	97.64	96.93	96.21	96.56
	235	96.47	98.72	99.51	98.76	97.81	93.88	99.20	98.62	97.55	97.93
	242	98.25	99.09	100.00	99.93	99.60	96.99	99.77	99.49	98.54	99.04
Sept. 6	249	98.98	99.44		100.00	100.00	98.67	100.00	99.75	99.16	99.76
	256	99.57	99.62				99.83		99.97	99.72	100.00
	263	99.73	99.96				100.00		100.00	100.00	
	270	99.81	100.00								
	277	99.90									
Oct. 11	284	100.00									

Date of 100% of count does not represent closure of fishway.

Table 10. Cumulative percent run to date Camp 1 Fishway 1986-1995

Date	Julian Day	Year									
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
June 23	174	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	181	0.46%	0.30%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	188	1.60%	3.29%	0.55%	3.04%	0.00%	0.00%	0.00%	0.07%	0.50%	0.00%
	195	3.33%	10.47%	8.07%	22.31%	12.03%	1.27%	0.88%	3.63%	8.47%	9.22%
	202	12.05%	17.99%	29.71%	44.96%	34.33%	4.45%	8.03%	14.39%	30.70%	31.74%
July 28	209	43.75%	17.99%	56.61%	67.10%	79.20%	25.82%	37.13%	29.14%	44.31%	64.41%
	216	64.08%	17.99%	71.74%	76.23%	92.91%	50.1%	72.43%	47.63%	64.76%	80.95%
	223	82.13%	17.99%	84.05%	90.93%	97.11%	71.45%	81.77%	75.05%	77.03%	89.82%
	230	87.31%	17.99%	91.20%	94.50%	98.23%	84.73%	93.04%	91.99%	87.13%	94.76%
August 25	237	91.93%	42.27%	96.20%	98.54%	99.25%	91.18%	98.43%	97.64%	91.24%	97.88%
	244	95.07%	52.53%	98.61%	100.00%	100.00%	100.00%	99.65%	99.33%	96.49%	98.84%
	251	98.18%	57.52%	99.07%				100.00%	100.00%	98.05%	99.26%
	258	99.20%	81.80%	99.91%						98.90%	100.00%
	265	99.82%	95.52%	100.00%						99.57%	
	272	100.00%	96.03%							100.00%	
	279		99.54%								
October9	282		100.00%								

Date of 100% of count does not represent closure of fishway.

Table 11. Cumulative percent of run to date for Grand Falls Fishway 1986-1995.

Date	Julian Day	Year								
		1986	1987	1988	1989	1990	1992	1993	1994	1995
July 3	184		0.00%		0.93%			0.00%		
	190		1.15%		1.89%	0.00%		0.17%	0.00%	0.00%
	197	0.00%	6.44%	0.00%	14.64%	3.56%	0.00%	0.85%	2.16%	5.35%
	204	6.28%	20.47%	9.77%	33.99%	16.44%	2.92%	0.89%	14.69%	17.55%
	211	20.09%	40.90%	26.59%	**55.04%**	32.85%	24.46%	15.18%	31.98%	**53.07%**
Aug. 6	218	30.13%	**61.86%**	**60.18%**	66.62%	**61.98%**	41.74%	32.58%	**60.94%**	73.10%
	225	**49.05%**	80.02%	76.02%	84.93%	78.58%	**59.54%**	**66.16%**	70.43%	82.94%
	232	80.69%	83.93%	83.85%	91.52%	86.68%	79.88%	82.43%	82.13%	88.02%
	239	85.45%	91.25%	90.23%	94.87%	97.51%	87.25%	90.42%	89.34%	90.10%
Sept. 3	246	89.74%	95.83%	98.05%	96.54%	100.00%	91.06%	92.12%	92.74%	91.89%
	253	92.86%	96.58%	98.05%	100.00%		91.06%	98.16%	93.34%	94.91%
	260	93.55%	97.11%	99.88%			96.22%	98.84%	94.13%	97.32%
	267	93.64%	99.64%	99.96%			98.28%	99.01%	94.94%	98.85%
Oct. 1	274	94.03%	99.69%	100.00%			99.40%	99.57%	99.43%	100.00%
	281	97.01%	100.00%				99.85%	100.00%	100.00%	
	288	98.36%					99.85%			
Oct.22	294	100.00%					100.00%			

Date of 100% of count does not represent closure of fishway.

Table 12. Details of spawners to lower Exploits.

Year	Released at Bishop Falls	Count at Camp 1	Spawners to Other Tributaries	Spawners to Tribuaties as % of Bishops	No. of fish to other Tributaries based on spawning survey	Fence Count Stony Brook	No. of fish unaccounte d for
1975	10657	6036	4225	39.65%			
1976	4451	3052	983	22.08%			
1977	6729	4571	1395	20.73%			
1978	4084	2785	671	16.43%			
1979	6992	4049	2434	34.81%			
1980	N/A	5023	N/A	N/A			
1981+	9777	4778	660	6.75%			
1982	7778	2918	2258	29.03%			
1983	N/A	3254+	N/A	N/A			
1984	17748	6411+	5679	32.00%			
1985	16833	6023	3712	22.05%			
1986	10002	3246	3035	30.34%			
1987	9324	2368	3236	34.71%			
1988	9121	3443	1900	20.83%			
1989	7281	1708	2574	35.35%			
1990	6751	1072	2313	34.26%			
1991	5338	1100	1993	37.34%			
1992	12852	3762	5975	46.49%	3666		2309
1993	21946	5927+	9436	43.00%	4237		5199
1994	17044	2821+	6023	35.34%	2542**	2886	
1995	16655	3113+	6104	36.58%			

* Tributaries = Three Brooks, LittleRattling, Stoney and Greenwoods Brooks
+ indicates a partial count
** Stoney Brook

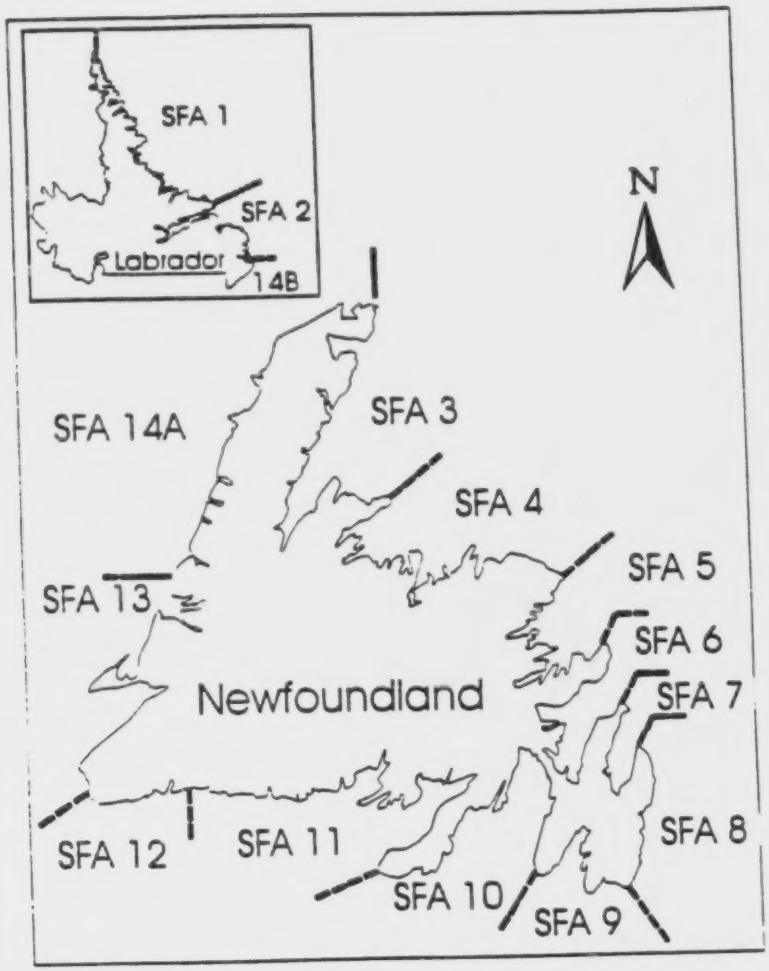

Fig. 1. Map showing the 14 Salmon Fishing Areas of the Newfoundland Region.

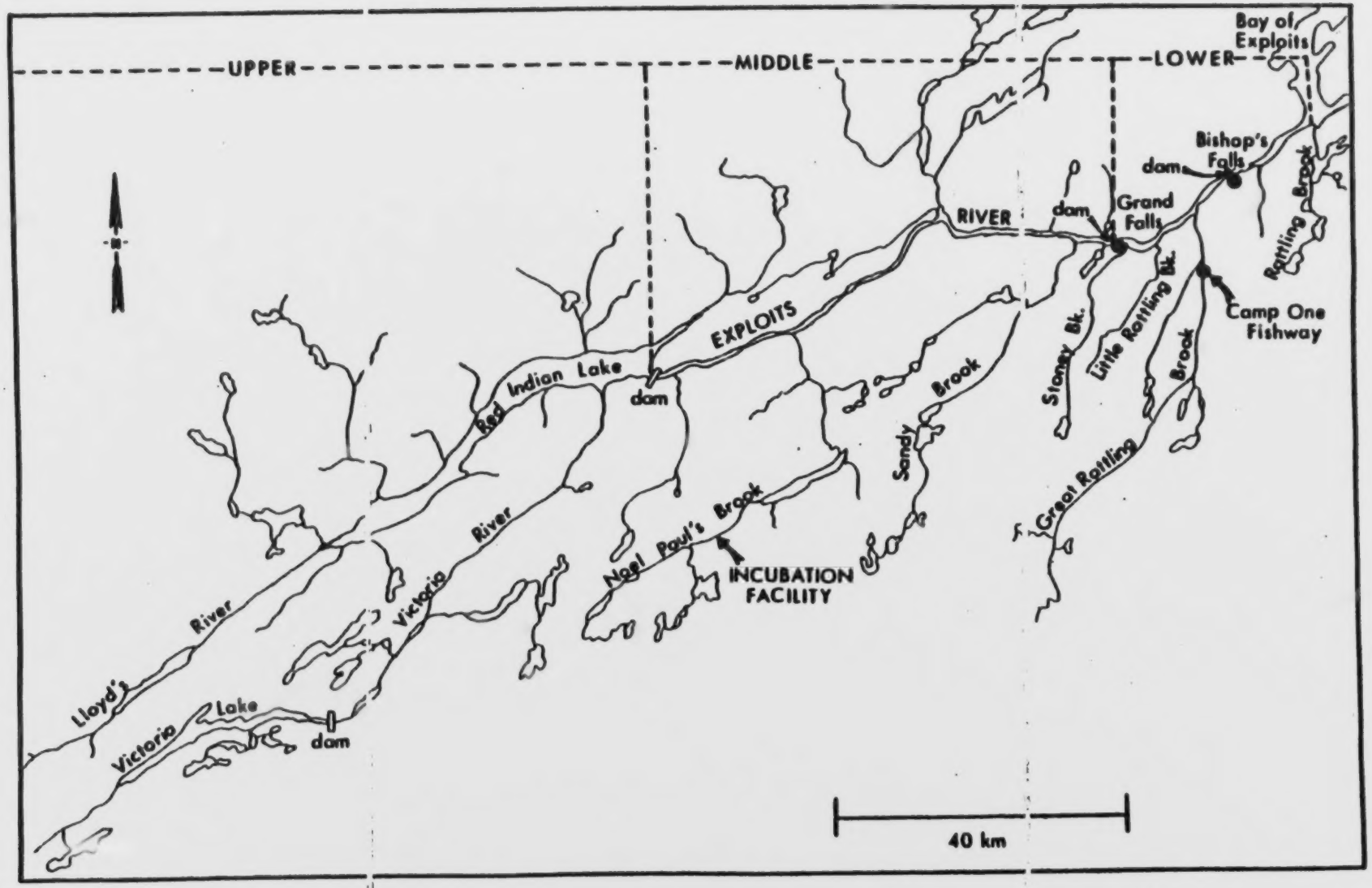

Fig. 2. Detailed map of the Exploits River system.